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TECHNOLOGICAL DEVELOPMENT AND ENERGY PLANNING IN AFRICA

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Introduction:

1. Technological development as a powerful tool for socio-economic development, is highly dependent on energy. Hence energy planning is a prerequisite to a national utilisation of available energetic resources, thus leading to a successful technological development, and a realistic socio-economic development. For many African countries, the process of socio-economic development was nearly stifled by the events of the 1973 oil price rises. Apart from the particularly adverse effects of these events on the economies of most developing countries, the problems also awakened the indigenous experts to the need to explore new and renewable sources of energy (NRSE) in order to meet local demands and thus become less dependent on imported fuel.

2. In recognition of this need to develop and promote the use of new and renewable sources of energy, the United Nations Conference on New and Renewable Sources of Energy, which met in Nairobi from 10 to 21 August 1981 has accorded a high priority to this energy sector in its Programme of Action, called the Nairobi Programme of Action for the Development and Utilization of New and Renewable Sources of Energy (NRSE). Energy Planning must necessarily be in line with this Nairobi Programme of Action. In this planning process one must establish priorities in the field of NRSE. It is necessary to consider a large number of parameters such as the availability of resources, the state of development of technology involved, the size, type, geographical location and time-frame of the energy requirements, the characteristics of the end users, as well as social, economic, environmental and technical considerations, the potential of increased energy efficiency and conservation and the relative impact on the energy transition. In this context, priority actions should be assigned to certain urgent programmes concerning principal energy needs in rural/urban areas of African countries and to a number of technologies utilizing NRSE which have reached a stage of maturity at which little or no further research and development are required for their widespread utilization.

3. The energy planning must therefore also [illegible] channels and procedures for the widespread diffusion or transfer of technology to all African countries, under conditions of mutual benefit to all parties, taking into account the basic needs for survival of rural/urban population of Africa. Such channels need to be established and supported through TCDC programmes or international co-operation, particularly in those cases where such technology originates in the developed countries.

4. Crisis situation in Africa

The present crisis situation in Africa where over half the population is affected by drought and food shortages, and where famine is affecting over six million people right now, calls for an urgent action from all concerned. Those technologies, readily available, utilising such energy sources as are easily exploitable, have to be adopted without further delay. It is time the nations and the experts stop speaking and start acting ! Simple solar technologies that can be easily applied are still in the drawers of many experts and government officials. Appropriate technologies, whatever their origin, have to be adapted and exploited in the African regions that are threatened by the crisis. Short term measures have to be singled out from long term measures, in order to cope with the situation. Technologies for survival must be a priority, and the pace of development and application of these technologies will determine the fate of African countries.

5. Solar energy as the principal energy for basic and urgent needs

Africa generally has not only a very low rate of energy consumption per capita, but it also exhibits within its boundaries a strikingly inequitable distribution of energy between rural and urban populations. Among the several potential new sources of energy, solar energy holds promise as a major supplementary source. Worldwide attention is now focused on methods of exploiting solar energy for a vast range of applications.

6. Discussion of potential application of solar energy and its possible benefits (by way of increasing energy supply in rural areas and in reducing human drudgery) will require consideration of sunlight's direct and indirect forms and its associated technologies. One should recognize that traditional sources of energy in most African countries, especially in rural areas, are already based heavily on the indirect conversion of solar energy; this occurs through photosynthesis in the form of final wood and agricultural residues, which constitute a major portion of the total energy consumption. Indeed, biological applications of solar energy are gaining increasing

importance. Efforts aimed at attaining a sustainable rate of consumption of these sources, through planned use of forests and development of fast-growing species of plants, are considered essential.

7. The use of solar energy in Africa must be viewed in different countries within the national context; they must take into account local rural situations. The foremost requirement is an inventory of energy basic needs, identifiying the relative quantity of energy required for various activities and, in addition, the pattern of energy consumption relating this quantity to the nature of its end-use. Thus it is considered extremely important that new energy technologies should be able not only to provide the required amount of energy but that this should be matched to the quality of its end-use.

8. It is useful to know the various energy needs that could be met by using solar energy, keeping in mind the element of appropriateness to the situations in African countries. The energy is required for domestic use (lighting, cooking, hot water, heating), agricultural processes (grinding, drying, storage, refrigeration), agriculture (irrigation, plenting, cultivation, harvesting), water pumping (drinking and household consumption, cattle watering, irrigation), social and community needs (health services, drinking water treatment, education). While it is difficult to envisage that any of the new and renewable sources of energy would be able to offer short-term solutions on a significant scale, they do offer the prospect of indigenous, readily available, and inexhaustible supplies which -through sustained efforts - can bring about an improvement in the quality of life of the people. A further advantage of renewable energy sources is their compatibility with the environment.

9. Examples of appropriate technologies utilizing NRSE available in Africa:

- Technologies for food production, processing, preservation, transport and marketing.

  Amongst the various technologies available, it is worth while mentioning the following, using mostly solar energy or its derivatives: solar driers, solar engines and pumps, solar refrigeration for cooling and storing agricultural products, solar stills for distillation, wind mills for local power generation, and the low-cost multi-purpose plowcart called 'krishimitra', developed in India. This last one can

be used for such farm operations like tilling, ploughing, cultivating, ridging, planting, harrowing, thrashing, irrigating, water pumping, grass-cutting and transporting farm inputs and products. It uses a six horse-power diesel engine, and has a load carrying capacity of one thousand kilograms.

- Technologies for domestic purposes. These include solar cookers, water pumps, water heaters, water purifiers, biogas generators and domestic stoves. The solar cookers and domestic stoves have the major advantage of reducing wood fuel consumption, thereby reducing deforestation and desertification. Small household biomas generators are also becoming very popular where sufficient biomas and water are available. The efflux from these biogas generators offer very valuable fertiliser material for the gardens.

- Technologies for social and community purposes, rural industries. These include pottery, spinning and weaving, furniture, metal work, community biogas digestors, biomass plantations, small hydropower, photovoltaic pumps and photovoltaic communication centres, etc.

10. It must be emphasided that all these technologies mentioned in the three sectors above are appropriate to African context, utilise little energy, mostly from new and renewable sources, and are easily available. In the process of energy planning, these are the technologies that have to be given priority, as they are suitable not only for improving the quality of life of the people, but also for giving them a technological base necessary for further technological development.

11. Need for 3 scenarios in energy planning

The scenario No.1 consists in the immediate application of measures to exploit available technologies with:

- identification of technologies that are sufficiently developed to the stage where their active promotion and use can be encouraged through dissemination of information and the establishment of demonstration, and replication units.
- identification, assessment and selection of technologies with the potential of being up-graded and commercialized on a large scale;

- Identification of institutions capable of undertaking the development work on the selected techologies and assignment of the up-grading work to these institutions;

- Conduction of training sources in selected institutions and demonstration sites.

12. The scenario No.2 consists in giving priority to the NRSE. African involvements in the area of development and promotion of NRSE are mostly just beginning. It is thus necessary to study, from an African point of view and outlook, the experiences of industrialized countries and, especially, those of Third World Asian countries, in order to propose the course of action necessary for the development and promotion of NRSE in Africa. It will be greatly rewarding if this work succeeds in making a modest contribution to the solution of the grave energy crisis presently plaguing African countries.

13. The scenario No.3 consists in taking measures with medium and long-term perspectives, like:

- promoting endogenous innovative activity and establishment of linkages between innovative systems and productive systems within the region, with increased research and developmental capabilities;

- promoting technical cooperation among member States in the fields of NRSE technological information and industrial property;

- providing assistance to the existing industrial property offices of member States with respect to:

  a) functions of an industrial property system hitherto omitted in the region:
     - promotion and encouragement of local research and national innovative activity in NRSE;
     - provision of advice and finance to needy indegenous investors in NRSE;
     - provision of information at national, regional and international levels on NRSE.

b) Establishment of or strengthening linkages with relevant development sectors and other potential users of NRSE:

- assisting member States in the development of low-cost technologies for any kind of energy sources.

14. Fiscal and promotional incentives

In order to popularise new and renewable energy systems, and stimulate technological development and economic growth based on these systems, it is necessary to provide financial and other promotional incentives to manufacturers and users of new and renewable energy equipments and gadgets. In many cases the initial costs of renewable energy equipments are high in relation to products utilising conventional energy sources, because of inadequate technological development, high cost of materials (solar photovoltaic as an example) and low scale of production. Measures that can be adopted are:

(a) Accelerated depreciation on machinery or plant used for manufacturing new and renewable energy systems and devices;

(b) exemption from central excise duties on such equipments;

(c) Bank loans on concessional terms to manufacturers and users of such equipments;

(d) free provision of patents and licenses to manufacturers, where possible.

These measures will surely accelerate the production and utilisation of such equipments.

Conclusion

The present pattern of economic and technological dependence is not congenial to the development of African countries. Continuing adjustments and institutional and structural changes in the international economic relations are required, in line with the objectives of the New International Economic Order. While this takes place, African countries must turn to themselves and, with strong political will and social committment, harness all their energies in their technological transformation. Effective energy policies, effective energy planning, and the application of available appropriate technologies are the very first steps towards this technological transformation and ensuing independence vis a vis the developed economies. Self reliance, self-sustained development with maximum exploitation of indigenous resources are goals that tally with the paths set out in the Lagos Plan of Action for the socio-economic development of Africa.